Jackson Foundation, Rockville, MD, USA; **S. Osmanov**, UNAIDS, Geneva, Switzerland; **M. Peeters**, IRD, Montpellier, France; **D. Pieniazek**, HIV/AIDS and Retrovirology Branch, Center for Disease Control and Prevention, Atlanta GA, USA; **M. Salminen**, National Public Health Institute, Helsinki, Finland; **P. M. Sharp**, Institute of Genetics, Univ. of Nottingham, Nottingham, UK; **S. Wolinsky**, Northwestern Univ. Medical School, Chicago, IL, USA; **B. Korber**, Los Alamos National Laboratory, Los Alamos, NM, USA, and Santa Fe Institute, Santa Fe, NM, USA.

References and Notes

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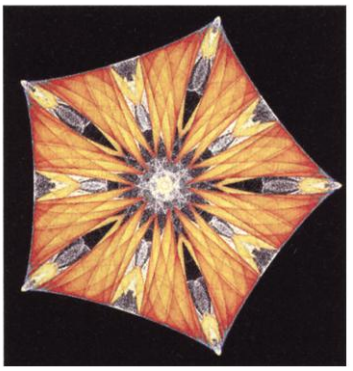
9. We thank D. Birx and F. McCutchan of the U.S. Army and the Henry M. Jackson Foundation; J. Bradac of the National Institute of Allergy and Infectious Diseases, National Institutes of Health; and T. Devine of the Pediatric AIDS Foundation for financial support of this meeting. We also thank the Santa Fe Institute for sponsoring the meeting.

Traces of Symmetric Chaos

The Editors' Choice selection entitled "Chaos underlying order" (Phillip D. Szuromi, 18 Feb., p. 1169) describes the work of Encinas-Sanz *et al.* (*1*), in which regular patterns arise when a system that is chaotic on short time scales (a few nanoseconds) is observed over longer time scales (around 100 nanoseconds). Their system is a laser beam, the nonchaotic dynamics of which is well known to exhibit many symmetric patterns. This fact, together with the reference to "rolls" in the long-term pattern, suggests that this effect is probably an example of "symmetric chaos," in which a symmetric dynamical system has a chaotic attractor (*2*). This attractor usually has symmetry, although not necessarily the same symmetry as the overall system because of the possibility that the symmetry could be broken. Short-term "snapshots" of the state of the system appear unstructured because short-term observations explore too small a region of the attractor for the overall symmetry to become apparent. Longer-term observations

in effect average or sum instantaneous observations over a subset of the attractor that is large enough to reveal the global symmetry. In mathematical models, the relevant symmetry arises through such things as the choice of domain for the model and its boundary conditions. In experiments, symmetry derives from the design of the apparatus and the underlying symmetry of physical laws.



An example of symmetric chaos in a mathematical model.

Within the nonlinear dynamics community, the concept of symmetric chaos was formulated in 1988 by Chossat and Golubitsky (*3, 4*) and has been extensively studied since (*5–7*). To date, the main experimental verification is that of Gluckman *et al.* (*8*) for the Faraday experiment, in which a thin layer of fluid in a dish is vibrated vertically. At suitable frequencies, the instantaneous state appears chaotic. However, the symmetry of the dish affects the symmetry of the underlying chaotic attractor, and this effect can be revealed by averaging the observed patterns over time. Chaos notwithstanding, the averaged observation is not featureless. In a square dish, the averaged pattern is a square-symmetric checkerboard of waves parallel to the sides of the dish. In a circular dish, the average is a "target pattern" of concentric circular rolls.

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Scientists at Brookhaven

For the News Focus article "Meltdown on Long Island" by Andrew Lawler (25 Feb., p. 1382), I did not say to Lawler that "The whole lab is corrupt," in reference to Brookhaven National Laboratory. Although the STAR (Standing for Truth About Radiation) Foundation has had the greatest reservations about the truthfulness and good faith of those charged with overseeing Brookhaven's nuclear capabilities, we nonetheless recognize the good scientific work being done by many research scientists there. It would be unfair to contaminate them all, if you will, with the same brush.

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Editors' note

Baldwin's comment was shortened during editing. The full quote was, "The whole lab as an institution is corrupt."

CORRECTIONS AND CLARIFICATIONS

News Focus: "A reluctant warrior" by Jocelyn Kaiser (18 Feb., p. 1190). Gene Likens' age should have been 65, not 67.

CREDIT: MIKE FIELD AND MARTY GOLUBITSKY, *SYMMETRY IN CHAOS* (1992)